REMARKS/ARGUMENTS

This Amendment is submitted in response to the Office Action mailed April 6, 2007. The deadline for responding has been extended to September 6, 2007 by a request for an extension of time made herewith.

Applicants undersigned representative hereby requests an interview prior to issuance of the next office action if the Examiner intends to maintain any of the outstanding rejections after consideration of the present amendment and remarks included herein. The Examiner is invited to call Applicants representative at 732-542-9070 to schedule the interview.

I. Introduction

Claims 1, 3-6 and 14 have been amended. New Claims 24-29 have been added to add claims in various formats. The amendment to claim 1 has been made to clarify the claim. In addition, claims 1 and 14 have been amended to indicate that "M and N are positive integers" thereby overcoming the objection to the claims. Claims 3-6 have been amended so that the preamble is consistent with the claim from which they depend, e.g., "method" has been changed to "device" in the claim preamble.

As will be discussed below, the pending claims are definite and neither anticipated nor rendered obvious by the applied references.

Claims 1-23 were objected to based on the failure to define M and N in various claims. M and N have been

defined to be positive integers in independent claims 1 and 14 thereby overcoming the objection to the claims.

Claims 1-23 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shattil et al (US Publication 2003/0147655) in view of Maric (US Patent No. 7,068,703).

As will be discussed below, none of the pending claims are anticipated or rendered obvious by the applied references.

II. The Pending Claims Are Patentable

A. Discussion of Various Exemplary Embodiments To Facilitate an Understanding of the Invention

For a better understanding of the invention, Applicants suggest the Examiner review the Summary of the invention section provided in the application. However, the following discussion of some exemplary embodiments should help the Examiner appreciate some of the differences between the claimed subject matter and the applied references.

The present invention is directed to frequency hopping transmission systems where signals are transmitted using a plurality of subcarrier signals. While mobile devices in a cell may use any of N subcarrier frequencies to transmit data over time in many systems during any given transmission period the mobile device may transmit on at most, M subcarrier frequencies where M<N.

In accordance with various embodiments of the invention, a device is provided with M different subcarrier amplification and filtering signal paths. The M signals,

each corresponding to a different subcarrier frequency, are combined prior to transmission. Rather than provide N different amplification and filtering paths, programmable signal generators are used in combination with programmable and/or fixed filters. At least one amplifier and filter is provided per subcarrier amplification and filtering signal path. In various embodiments, the circuitry on each subcarrier amplification and filtering path is the same with a control module determining the subcarrier frequency generated by signal generator on each individual subcarrier path. In one embodiment, the filters are made programmable and are controlled by the frequency control module used to control the subcarrier signal generators. However, in another exemplary embodiment which uses fixed, as opposed to programmable filters on individual subcarrier signal amplification and filtering paths, each fixed filter used in a subcarrier signal path has a passband which is several times wider than the subcarrier. In one particular exemplary embodiment each fixed filter is at least as wide as N times the frequency spacing between subcarrier signals. Such a wide filter allows any subcarrier amplification and filtering path to be used with any one of the N subcarrier frequencies which may need to be supported.

As will be discussed below, the applied references alone or in combination do not teach, disclose or suggest the novel approach to frequency hopping of various filter features covered in various claims.

B. The Pending Claims Are NOT Obvious in View of the Applied References

1. Discussion of Features which Render Independent Claims 1 and 14 patentable

As will be discussed below, **the Shattil et al.** reference, whether considered alone or in combination with the Maric patent, **fails to disclose or suggest the following features found in amended Independent claim 1:**

> **a frequency control circuit for controlling which of the N subcarrier frequencies are generated** and used by said device for the transmission of signals;
> a plurality of M separate subcarrier signals paths operating in parallel, each of the M subcarrier signal paths including a programmable signal generator coupled to said frequency control circuit, a power amplification circuit and a filter circuit, **said programmable signal generator for generating a subcarrier signal determined by said frequency control circuit** and having a subcarrier frequency corresponding to said subcarrier signal path to which said signal generator corresponds ...

Similarly, the Shattil et al. reference, whether considered alone or in combaintion with the Maric patent **fails to disclose or suggest the following features found in claim 14:**

> i) **operating M programmable signal generators to generate said M subcarrier signals;**
> ii) separately processing each of the M subcarrier signals to produce M processed subcarrier signals, the processing of each of said M subcarrier signals including a amplification operation and a filtering operation, said separate processing thus including M separate filtering operations;

iii) combining the M processed subcarrier signals to generate a frequency division multiplexed transmission signal;

iv) **controlling at least one of said M programmable signal generators to change the frequency of the subcarrier signal generated by said at least one programmable signal generator**; and

v) repeating steps (i), (ii), and (iii).

For the above reasons claims 1 and 14 are patentable. Dependent claims 2-13 and 15-23 are patentable for the same reasons that claims 1 and 14 are patentable over the applied references.

2. Detailed Discussion of The Rejection of Claims 1 and 14 and why the Rejection should be Withdrawn

Claims 1-23 stand rejected under 35 U.S.C. 103(a)as being unpatentable over of Shattil et al. (US Pub. Number 2003/0147655) in view Maric (US Patent Number 7,068,703).

The secondary reference Maric, is cited as "teaching a frequency hopping device (column 1, line 12) and where M<N (figure 3A, column 6, line 43)." (Office Action page 4) The Examiner goes on to state: "… it would have been obvious to one ordinary skill in the art at the time the invention was made to use frequency hopping technique as taught by Maric et al. In a multi-carrier communication system such as OFDM …"

Applicants respectfully submit that Applicants are not claiming that frequency hopping is new. However, Applicants novel **method and apparatus which can be used to implement frequency hopping**, **are** new and not anticipated or

rendered obvious by the Maric et al. reference which teaches a different way of implementing frequency hopping. Accordingly, as will be discussed below, even if combined with the Shattil et al. patent, the combination would not render obvious the claimed subject matter since the Shattil et al. patent also fails to anticipate or render obvious the features noted above.

To understand what a combination based on the Maric patent would look like first requires an appreciation of how frequency hopping is done in the Maric patent. **Frequency hopping in Maric et al. is NOT implemented by controlling the frequency of signals which are generated by programmable signal generators but rather through the use of a switch 618 which multiplexes symbols onto the proper subbands.** In the Marick patent (See fig. 6) a controller supplies a frequency hopping (FH) sequence to a switch 618 which received the output of modulator 616 and various pilot signals. The switch 618 "receives the data symbols and pilot symbols and multiplexes these symbols onto the proper data and pilot subbands. ... Switch 618 also provides a signal value of zero for each subband not used for pilot or data transmission." (See Col. 10, lines 4-19)

It should be appreciated that this switch based approach to frequency hopping is **different from the currently claimed method and apparatus** and that combining the frequency hopping features of Maric with the Shattil et al. patent would still not render obvious the claimed subject matter.

To better explain some of the differences between the applied references and the claimed subject matter, Applicants will now discuss some of the Examiner's comments

with regard to the Shattil et al. reference. The Examiner cites element 418n as the frequency control circuit of claim 1 stating:

> Shattil et al., discloses …
>
> > **a frequency control circuit (figure 4, 418n)** for controlling which of the N subcarrier frequencies are used by said device for the transmission of signals (paragraph 0111, lines 4-8); (Office Action page 3)

Applicants respectfully submit that element 418n is an **amplitude control system** which can be used for carrier selection or deletion but it does not control the frequency generated by a programmable signal generator. Accordingly, the optional amplitude-control system 418n clearly does not anticipate or render obvious: "**a frequency control circuit for controlling which of the N subcarrier frequencies are generated** and used by said device for the transmission of signals" as currently recited in claim 1.

Applicants interpretation of the element 418n in Shattil as being an optional amplitude-control system is supported by paragraphs [0110] and [0111] of the applied reference which state:

> [0110] **Each CI carrier may have its gain adjusted by an optional amplitude-control system 418n.** The amplitude-control system 418n is adapted to provide a gain profile to the CI signals. This profile may include a tapered-amplitude window with respect to the frequency domain, compensation for flat fading of the carriers in the communications channel, and/or pulse-amplitude modulation of the CI carriers. The signals may be predistorted in the transmitter in

> such a manner that compensates for fading and/or inter-symbol interference of the channel upon transmission. Pulse shaping (e.g., windowing) may be provided, such as described in U.S. Pat. No. 5,955,992.
>
> [0111] An amplitude-control system includes any apparatus, method, and/or algorithm adapted to provide a predetermined frequency-domain gain profile to a set of multi-carrier signals. **An amplitude-control system may provide carrier selection (or equivalently, carrier deletion).** Amplitude-control systems may include windowing systems, filters, spectrum allocation systems, and/or any other type of spectrum shaping systems. (bold added)

In view of the above, it should be appreciated that the Shattil reference fails to disclose the **frequency control circuit recited in claim 1** and that the rejection of claims 1 and the claims which depend therefrom should be withdrawn for this and for this reasons and the reasons discussed with regard to the secondary reference.

With regard to independent claim 14, the Examiner cites paragraph [0111] and apparently relies the **amplitude-control system** of the Shattil reference as disclosing:

> iv) controlling at least one of said M programmable signal generators to change the frequency of the subcarrier signal generated by said at least one programmable signal generator

Applicants respectfully submit that while the amplitude-control system of Shattil may be used to **eliminate** a subcarrier **it does not control a programmable signal generator to change the frequency of the subcarrier signal being generated.** Applicants respectfully submit that **controlling the gain** of a carrier by using a weight (as suggested by the discussion of Fig. 9) or by deleting

it as suggested by paragraph [0111], **is very different from controlling the frequency** of a signal being generated.

Accordingly, the rejection of claim 14 should be with drawn since the Shattil reference does not disclose the feature of claim 14 discussed above. The rejection should also be withdrawn because of the shortcoming of the portion of the rejection which are based on the Maric patent.

In view of the above, it should be appreciated that the rejections of claims 1 and 14 and all the claims which depend therefrom should be withdrawn.

3. Additional Reasons Dependent Claims 2 and 16 are Patentable

Dependent claim 2 is patentable for the reasons claim 1 is patentable but also because it recites:

> The device of claim 1, wherein each of the M signal filter circuits, that **each correspond to a different one of said M signal paths, is a fixed filter, at least one of the M fixed filters having a passband bandwidth at least equal to Y times the average frequency spacing between the N frequencies that said device can use as the N subcarrier frequencies, where Y is a positive number greater than 1.**

Applicants respectfully submit that the portions of the Shattil reference cited by the Examiner do not disclose or suggest the use of a fixed filter having "a passband bandwidth at least equal to Y times the average frequency spacing" as recited in claim 2. Accordingly, the rejection of this claim and the claims which depend therefrom should be withdrawn. The rejection of claim 16 should be withdrawn for similar reasons.

Applicants will support their assertion that the Examiner has failed to disclose the above quoted filter features by quoting the portions of the Shattil reference used by the Examiner to reject claim 2.

In rejecting claim 2, the Examiner states:

> **Regarding claim 2:**
> Shattil et al. further discloses: Each of the M signal filter circuits (filter bank include plurality of filter) Figure 13, 1302), that each correspond to a different one of said M signal paths, is a fixed filter (a fixed filter is interpreted to be a filter) **(paragraph 0101, lines 5-13)** at least one of the M fixed filters having a passband bandwidth (this limitation is inherent because passband is the portion of spectrum, between limiting frequencies, that is transmitted with minimum relative loss or maximum relative gain by a filtering device) at least equal to Y times the average frequency spacing between the N frequencies that said device can use as the N subcarrier frequencies **(figure 6, 601, 602, 603)**, where Y is a positive number greater than 1 **(paragraph 0075, lines 1-4)**. (Office Action page 5)

Paragraph 0101 lines 5-16 cited by the Examiner state:

> [0101] Carrier mixers or a carrier generator, as described herein, includes any type of system, method, or combination thereof adapted to perform at least one of a plurality of functions, including carrier generation, carrier selection, carrier allocation, and modulation. Carrier mixers imply the existence of a carrier generator (e.g., a multi-carrier generator).

Notably, there is no mention of filters or filter bandwidth in this portion of the Shattil reference cited by the Examiner with regard to claim 2.

A review of Figure 6 and elements 601, 602, 603 cited by the Examiner in the rejection of claim 2 also reveals a lack of any mention of fixed filters or the bandwidth of a fixed filter. Figure 6 merely illustrates "a plurality of equally spaced, contiguous carriers and a non-contiguously spaced subset of the carriers allocated to a particular user or data stream. [See paragraph 0030]. Elements 601, 602, 603 merely represent one set of non-adjacent carrier frequencies. (See paragraph [0075]

Finally with respect to claim 2, the Examiner suggests that Applicants see paragraph 0075, lines 1-4 which state:

> [0075] The carriers 601, 602, and 603 (which represent one set of non-adjacent carrier frequencies allocated to a particular user or data stream) are separated by an integer multiple L of the adjacent carrier frequency separations f.sub.s. The frequency spacing of the set of non-adjacent carriers 601, 602, and 603 is f.sub.s'=Lf.sub.s.

Applicants respectfully submit that [0075] which discusses carrier spacing also **fails to discuss filters or filter bandwidth**.

It is respectfully submitted that discussions of carrier spacing in no way anticipate or render obvious the features relating to a filter recited in dependent claims 2 and 16. Accordingly, the rejections of these claims and the claims which depend therefrom should be withdrawn.

III. New claims 24-29 Are Patentable

New claims 24-29 are patentable for the same or similar reasons that claim 1 is patentble.

IV. Conclusion

In view of the foregoing amendments and remarks, it is respectfully submitted that the pending claims are in condition for allowance. Accordingly, it is requested that the Examiner pass this application to issue.

If there are any outstanding issues which need to be resolved to place the application in condition for allowance **the Examiner is requested to call (732-542-9070) and schedule an interview with Applicant's undersigned representative**. To the extent necessary, a petition for extension of time under 37 C.F.R. 1.136 is hereby made and any required fee in regard to the extension or this amendment is authorized to be charged to the deposit account of Straub & Pokotylo, deposit account number 50-1049.

None of the statements or discussion made herein are intended to be an admission that any of the applied references are prior art to the present application and Applicants preserve the right to establish that one or more of the applied references are not prior art.

Respectfully submitted,

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